

## CLAIMS

What is claimed is:

1. In a wireless transmitter, a physical layer processor comprising:
  - a source signal including data;
  - 5 an FEC (Forward Error Correction) coder to receive the source signal and produce an enhanced source signal including data coded with error correction information;
  - a demultiplexer coupled to receive the enhanced source signal from the FEC coder;
  - 10 a plurality of modem processors, each of which is coupled to a unique output of the demultiplexer to process respective portions of the enhanced source signal in independent channels;
  - a summer coupled to receive outputs of the modem processors to produce an aggregate signal, the aggregate signal being a summation of the enhanced signal processed in independent channels; and
  - 15 a transmitter to transmit the aggregate signal over a carrier frequency.
2. The wireless transmitter of claim 1, wherein the aggregate signal comprises a spread-spectrum signal.
3. The wireless transmitter of claim 2, wherein the spread-spectrum signal
  - 20 comprises a direct-sequence spread-spectrum signal.
4. The wireless transmitter of claim 1 provided in a base station of a wireless communication system.

5. The wireless transmitter of claim 1 provided in a subscriber station of a wireless communication system.
6. The wireless transmitter of claim 1, wherein the FEC coder operates according to an iterative systematic nested code.
- 5 7. The wireless transmitter of claim 1, wherein the FEC coder operates according to a turbo product code.
8. The wireless transmitter of claim 1, wherein the FEC coder according to a convolutional turbo code.
9. The wireless transmitter of claim 1, wherein the plurality of modem processors  
10 are configured in a pooling arrangement.
10. The wireless transmitter of claim 1, comprising a second FEC coder, the first and second FEC coders configured in a pooling arrangement.
11. In a wireless receiver, a physical layer processor comprising:
  - 15 a receiver that receives a wireless signal from a transmitter, the wireless signal being formed at the transmitter by a summation of portions of a coded signal that were processed in independent channels but were wirelessly transmitted as a single aggregate signal;
  - a plurality of demodulators coupled to receive an output of the receiver;
  - and
  - 20 a multiplexer coupled to direct an output of the demodulators to an FEC (Forward Error Correction) decoder to recover a single unitary information signal.

12. The wireless receiver of claim 11 provided in a base station of a wireless communication system.
13. The wireless receiver of claim 11 provided in a subscriber station of a wireless communication system.
- 5 14. The wireless receiver of claim 11, wherein the FEC decoder operates according to an iterative systematic nested code.
15. The wireless receiver of claim 11, wherein the FEC decoder operates according to a turbo product code.
16. The wireless receiver of claim 11, wherein the FEC coder according to a  
10 convolutional turbo code.
17. The wireless receiver of claim 11, wherein the plurality of demodulators are configured in a pooling arrangement.
18. The wireless receiver of claim 11, comprising a second FEC decoder, the first and second FEC decoders configured in a pooling arrangement.
- 15 19. In a wireless communication system, at least one of a base station and a subscriber station comprising:
  - a local transmitter having a physical layer processor comprising:
    - a source signal including data;
    - an FEC (Forward Error Correction) coder to receive the source  
20 signal and produce an enhanced source signal including data coded with error correction information;

a demultiplexer coupled to receive the enhanced source signal from the FEC coder;

5 a plurality of modem processors, each of which is coupled to a unique output of the demultiplexer to process respective portions of the enhanced source signal in independent channels;

a summer coupled to receive outputs of the modem processors to produce an aggregate signal, the aggregate signal being an summation of the enhanced signal processed in independent channels; and

10 a transmitter to transmit the aggregate signal over a carrier frequency; and

a local receiver having a physical layer processor comprising:

15 a receiver that receives a wireless signal from a remote transmitter, the wireless signal being formed at the remote transmitter by a summation of portions of a coded signal that were processed in independent channels but were wirelessly transmitted as a single aggregate signal;

a plurality of demodulators coupled to receive an output of the wireless receiver; and

20 a multiplexer coupled to direct an output of the demodulators to an FEC (Forward Error Correction) decoder to recover a single unitary information signal.

20. The at least one of a base station and a subscriber station of claim 19, wherein the wireless communication system comprises a spread-spectrum communication system.

25 21. The at least one of a base station and a subscriber station of claim 19, wherein the wireless signal comprises a full-duplex signal.

22. The at least one of a base station and a subscriber station of claim 19, wherein the full-duplex signal comprises a frequency-division duplex (FDD) signal.
23. The at least one of a base station and a subscriber station of claim 19, wherein the wireless signal comprises a non-full duplex signal.
- 5 24. The at least one of a base station and a subscriber station of claim 23, wherein the non-full-duplex signal comprises a time-division duplex (TDD) signal.
25. The at least one of a base station and a subscriber station of claim 23, wherein the non-full-duplex signal comprises a half-duplex signal.
26. The at least one of a base station and a subscriber station of claim 23, wherein  
10 the non-full-duplex signal comprises a simplex signal.
27. A physical layer signal processor for use in transmitting a wireless signal, the signal processor comprising:
- 15 a Forward Error Correction (FEC) encoder, connected to receive a source signal, and to apply an error correction code;
- a demultiplexer in communication with the FEC encoder, the demultiplexer outputting two or more demultiplexed encoded signals;
- a plurality of modem processors, each receiving a respective one of the plurality of the demultiplexed encoded signals, the modem processors each modulating a respective one of the demultiplexer outputs applied thereto to  
20 produce a respective one of a plurality of transmission code modulated signals, the signal processor further characterized by:
- a summer that is connected to receive the plurality of transmission code modulated signals to thereby produce an aggregate signal; and

a transmitter connected to receive the aggregate signal output by the adder, for producing an aggregate transmitted signal.

28. The processor of claim 27 provided in a base station of a wireless communication system.
- 5 29. The processor of claim 28, wherein the wireless communication system comprises a spread-spectrum communication system.
30. The processor of claim 27 provided in a subscriber station of a wireless communication system.
- 10 31. The processor of claim 30, wherein the wireless communication system comprises a spread-spectrum communication system.
32. The processor of claim 27, wherein the FEC encoder operates according to an iterative systematic nested code.
33. The processor of claim 27, wherein the FEC encoder operates according to a turbo product code.
- 15 34. The processor of claim 27, wherein the FEC encoder encodes according to a convolutional turbo code.
35. A method for transmitting a high data rate signal over a wireless radio channel comprising the steps of:  
enhancing the high data rate signal with the Forward Error Correction (FEC) code;
- 20

distributing the enhanced high data rate signal over a plurality of demultiplexed signals;

encoding each of the plurality of demultiplexed signals with a spread-spectrum transmission code;

5 characterized by the additional steps of:

summing the plurality of spread-spectrum transmission encoded signals to produce an aggregate signal; and

modulating the aggregate signal, to produce a transmitted signal.

10 36. The method of claim 35 in which the transmitted signal is provided to a base station of a wireless communication system.

37. The method of claim 35 in which the transmitted signal is provided to a subscriber station of a wireless communication system.

38. The method of claim 35, wherein the FEC decoder operates according to an iterative systematic nested code.

15 39. The method of claim 35, wherein the FEC decoder operates according to a turbo product code.

40. The method of claim 35, wherein the FEC decoder operates according to a convolutional turbo code.